

# Vehicle-Grid Integration Communications Protocol Working Group Meeting

December 18, 2018

At

CPUC Auditorium

San Francisco, CA

# Agenda

- Commissioner Remarks and appreciation of stakeholders
- Coffee and breakfast
- Presentation and discussion of definitions
- Summary of current proposal and review of outline of final report
- CEC presentation of next steps
- Lunch
- CARB presentation of next steps
- Discussion of Metering requirements
- Cybersecurity considerations
- Discussion of state agencies future plans on the VGI Roadmap and additional items for discussion during the Roadmap process

Coffee Break until 10:40

# Presentation and discussion of definitions

- Dean Taylor, SCE

# How does this all fit in?

- <https://zevunit.kumu.io/vgi-next-steps>

# Current Proposal

- CPUC, ARB, CAISO, GO-Biz supported proposal for EVSE hardware functionalities
- Key changes since prior meeting
  - Additional explanation for not recommending a communications protocol(s) requirement
  - Explanation for scope of recommendation to focus on AC L2, multi-user
  - Reorganized hardware requirements table → Power Flow Entity to EVSE category
  - Other minor edits based on stakeholder comments

# Discussion Questions on Current Proposal

- Do Tables 1 & 2 reflect stakeholder comments?
  - Any more detailed hardware requirements necessary?
- What type of documentation do IOUs need to ensure EVSE compliance with hardware requirements?

# Draft Outline for Final Report

- [Outline](#)



## Recommended Next Steps for VGI Communications Protocols Working Group

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**Reynaldo Gonzalez**

Energy Research and Development Division  
California Energy Commission  
December 18, 2017

# Overview

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- CEC is recommending that the CPUC consider the following three attributes for the IOUs' EV charging programs when formulating its requirements.
  1. Speed
  2. Metering
  3. Simplicity
- Research and Data Opportunities



# Speed

- Electric vehicles (EVs) must communicate load controls within low-latency times that are consistent with CAISO's existing grid management requirements
- A key attribute is reducing latency times consistent with FERC Order 794 –frequency response reliability standards
- Current markets for frequency regulation require responses within 4-second intervals



- CAISO Resource Certification & Testing <http://www.caiso.com/Documents/5300%20-%20Resource%20certification%20and%20testing>
- CAISO Frequency Response Issue Paper per FERC Order 794, Figure 1 and Table 3, [https://www.caiso.com/Documents/IssuePaper\\_FrequencyResponsePhase2.pdf](https://www.caiso.com/Documents/IssuePaper_FrequencyResponsePhase2.pdf)

# Metering

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- Metering will provide system visibility and control for all segments
- Capturing value (e.g. LCFS credit, EV-specific tariffs) requires proof of accuracy
- Pathways exist for both SEP 2.0 and ISO 15118 to satisfy auditing and accuracy needs



Department of Food and Agriculture, Division of Measurement Standards, Electric Vehicle Fueling Systems regulation  
[https://www.cdfa.ca.gov/dms/pdfs/regulations/Handbook44\\_2016\\_340ElectricVehicleFuelingSystems.pdf](https://www.cdfa.ca.gov/dms/pdfs/regulations/Handbook44_2016_340ElectricVehicleFuelingSystems.pdf)

# Simplicity

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- Basic communication protocols of electric vehicles and electric vehicle service equipment already reside within J1772.
- All EVSE must have the ability to seamlessly send and receive EV driver-specific charging preferences and payments across all geographic regions regardless of utility or service provider



# Research and Data Opportunities

- Future IOU projects providing data about EV aggregations will help further understand the 3 technical attributes:
  - Characterizing the EV aggregations across power system and geographic locations – e.g. regardless of whether the EV resources are dispersed across a territory, or clustered on utility circuits, are affecting loading within buildings
  - The different markets in which EV aggregations participate in (e.g. frequency regulation, demand response)
  - Rate of EV driver participation events in these aggregations / grid services
  - Other DERs besides EVs (e.g. stationary batteries, smart building loads) that are included in these resource aggregations
  - Performance of the aggregated resource and of the individual EVs/EVSEs, for audit, incentive attribution, and billing purposes



# Conclusion

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- CEC will continue to support our multi-agency efforts in Vehicle-Grid Integration and all areas surrounding this space
- CEC supports any solution that best addresses the fundamental 3 core attributes
- CEC will continue to invest in exploring and validating progressive attributes to support a robust, holistic, and simple Vehicle-Grid Integration system





# Questions & Comments

Reynaldo Gonzalez  
Energy Research & Development Division  
California Energy Commission

# Lunch

- We will be back at

# Electric Vehicle Charging Station Open Access Act

# Electric Vehicle Charging Stations Open Access Act

- SB 454 (Statutes of 2013)
- California Health and Safety Code § 44268, 44268.2
- No membership requirement to use publically available EVSE
- Fees to use EVSE must be disclosed at point of sale
- Credit card/mobile technology for payment
- Location and payment info must be provided to NREL
- State may adopt interoperability billing standards

# Process timeline

- Workgroup and individual meetings
- Public workshop March/April 2018
- Staff report released August 7, 2018
- Public Hearing scheduled September 27-28, 2018

# VGI Interest Group Proposed Meetings for 2018

- GoToWebniar
- Quarterly, First Tuesday
  - February 6, 2018
  - June 5, 2018
  - October 2, 2018
  - December 4, 2018

# Topics to cover

- Value discussion take 2?
- What ancillary services could be cost effective for vehicles to provide?
- How many electric vehicles charging during the middle of the day would be necessary to absorb overgeneration and negative wholesale pricing?
- Any suggestions...

# Contact information

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# Applicability of Recommendation to IOU Proposals

- Applicable to current light-duty proposals?
  - Current feedback from stakeholders: No.
- Utility discussion of communications architecture for pending proposals:
  - SDG&E Residential Charging
  - PG&E DCFC
- Applicability to future light-duty proposals
  - Based on recommendation, would apply to any AC Level 2, multi-user, conductive EVSE IOU proposal
  - Should we re-evaluate recommendation in future?



CALIFORNIA DEPARTMENT OF  
FOOD & AGRICULTURE

# Division of Measurement Standards Workshop for Electric Vehicle Charging Station Requirements

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SERVING AND PROTECTING CALIFORNIA'S CONSUMERS,  
BUSINESSES, ECONOMY AND ENVIRONMENT



# Workshop Overview

- Scope of Workshop
- U.S. and California Weights and Measures Laws and Regulations
- Legislation and Regulatory Authority
- National Institute of Standards and Technology (NIST) Handbook 44
- Device Requirements
- Type Evaluation
- Regulatory Language

# Workshop Scope

- **This Workshop IS About**

- Early stakeholder communication
- Regulatory Authority over Commercial EVSE
- Measurement standards for commercial transactions
- Type Evaluation - National and California

- **This Workshop is NOT About**

- Non-commercial Electric Vehicle Charging Stations (EVSE) or electric vehicle charging stations under CPUC authority
- Non-public access workplace charging

# U.S. Weights and Measures Laws and Regulations

- No Federal Weights and Measures Law in the U.S.
- Federal Government provides technical assistance through National Institute of Standards and Technology (NIST)
- States can and do develop their own weights and measures laws
- However, most states rely on adoption of uniform laws developed by the National Conference on Weights and Measures (NCWM)
- NCWM members include California state and county officials and many industry sector members (EVSE manufacturers)

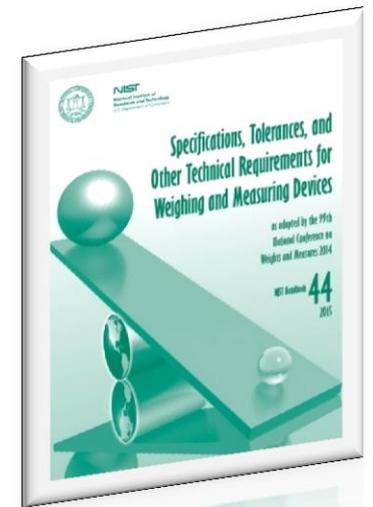
# U.S. Weights and Measures Laws and Regulations

- Within the U.S. Department of Commerce is the NIST Office of Weights and Measures (OWM)
- NIST OWM provides technical guidance to NCWM and focused workgroups
- NCWM with input from members (federal, state, local, and industry) develops consensus standards
- NIST publishes handbooks containing NCWM Standards
- States may or may not adopt model laws/regulations

# National Institute of Standards and Technology

## Handbook 44

- Specifications, Tolerances and Other Technical Requirements for Commercial Devices
- Used by CDFA DMS for Type Evaluation of new makes/models of devices, e.g., EVSE
- Used by counties as a field enforcement manual
- Used by manufacturers when designing new commercial weighing and measuring devices



# CA Weights and Measures Laws and Regulations

- Law: California Business and Professions Code, Division 5  
<http://leginfo.legislature.ca.gov/faces/codes.xhtml>
- Regulations: California Code of Regulations, Title 4, Division 9  
<http://www.oal.ca.gov/ccr.htm>

## Legislation

- Assembly Bill 808 (Ridley-Thomas, Chapter 591, Statutes of 2015)
  - Clearly establishes the Department's authority over commercial sales of alternative automotive fuels including electricity
  - Includes Advertising Exemptions for EVSE

## Other Rulemaking

- Handbook 130: Method of Sale for electricity to fuel light duty vehicles. (megajoule or kilowatt hour)

# Adoption into Regulation: Two Methods

1. Business and Professions Code, Division 5, Section 12107 adopts NCWM Uniform Laws and Regulations by reference
  - Examples: gas pumps, grocery scales
2. Section 12107 also authorizes addition, modification, or rejection by regulation
  - Examples: electric watthour meters (utility submeters), hydrogen dispensers

# CA Weights and Measures Laws and Regulations

- Who Enforces? The State and 55 County Offices of Weights and Measures covering all 58 counties
  - State: California Department of Food and Agriculture, Division of Measurement Standards (CDFA DMS)
  - State: Maintains standards (mass, length, volume, electric current, etc.), evaluates new types of measuring devices, oversees work performed by counties
  - Counties: Local departments of weights and measures perform the majority of all field inspections and enforce device compliance requirements
  - State and County Officials conduct routine field testing and complaint monitoring to ensure continued compliance with NIST Handbook 44

# Commercial EVSE Device Requirements

- Type Evaluation performed by a laboratory authorized by the NCWM's National Type Evaluation Program (NTEP) and issuance of a certificate of conformance for device or measuring system. (Provisional Cert)
- Alternatively, receipt a certificate of approval through the California Type Evaluation Program (CTEP). (California Specific)
- System conforms to NIST Handbook 44 Section 3.40 Requirements including, but not limited to: Accuracy; Repeatability; Suitability; Indications; Recorded Representations; Sealing Provisions; and prevents Facilitation of Fraud

# Commercial EVSE Device Requirements

- Type evaluation is conducted by testing the *measuring system as whole*, not just the metering element.
- 1.0% Acceptance Tolerance is applied during type evaluation and during initial verification of newly installed EVSE.
- 2.0% Maintenance Tolerance is applied during periodic re-inspection of installed commercial EVSE.
- Communication protocols, data transmission, and power delivery upstream of the EVSE is not a consideration for type evaluation.
- EVSE must deliver within tolerances the quantity of energy displayed and charged to the customer. Customer must be informed of applicable charges prior to beginning of charge session

# Proposed Changes to CCR, Title 4, Division 9

## Article 1, § 4001. Exceptions

### 3.40. Electric Vehicle Fueling Systems – Tentative Code and Preamble

#### **Section 3.40. Electric Vehicle Fueling Systems –~~Tentative Code~~**

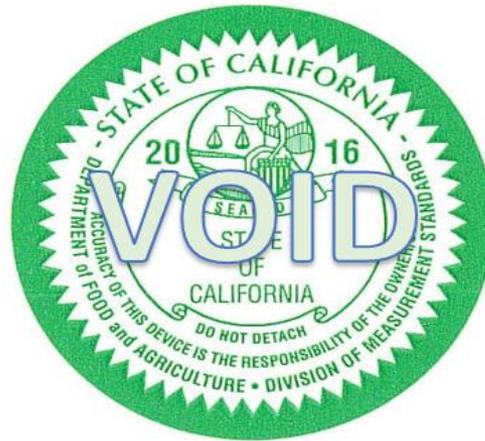
~~This tentative code has a trial or experimental status and is not intended to be enforced. The requirements are designed for study prior to the development and adoption of a final code. Officials wanting to conduct an official examination of an Electric Vehicle Supply Equipment (EVSE) or system are advised to see paragraph G A.3. Special and Unclassified Equipment.~~

## Next Steps:

- Publication of proposed regulation in Notice Registry.
- Feedback from Stakeholders to [dms@cdfa.ca.gov](mailto:dms@cdfa.ca.gov) ongoing through rulemaking process.
- California will formalize test procedure for type evaluation of EVSE
- State will provide an Examination Procedures Outline to counties
- Counties will begin registering commercial EVSE (Business and Professions Code Section 12240)
- Counties will begin examining and sealing commercial EVSE (Business and Professions Code Section 12210)

# ULTIMATE GOAL

Successful Commercialization of EVSE



# Thank You!

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# Discussion of Metering Requirements

- Should the hardware recommendation include metering requirements?
  - No.
    - Handbook 44 will apply to commercial EVSE anyways
    - We need additional discussions on use cases and metering & telemetry requirements that meet Local Regulatory Authority (LRA) or CAISO requirements for grid services settlement
  - Yes, specify the Handbook 44 metering accuracy requirements.
    - Handbook 44 does not apply to transactions where there is no payment, so best to specify this



# Cybersecurity Considerations

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December 18, 2017

# Open Questions

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- What previous work is applicable for our considerations?
- How does using multiple protocols affect cybersecurity?
- Upon which devices should standards be applied?
- Which standards are needed to ensure cybersecurity?
- When and where should they be applied?
- Which parties are responsible?



# Resource: NESCOR Utility Penetration Testing Guide

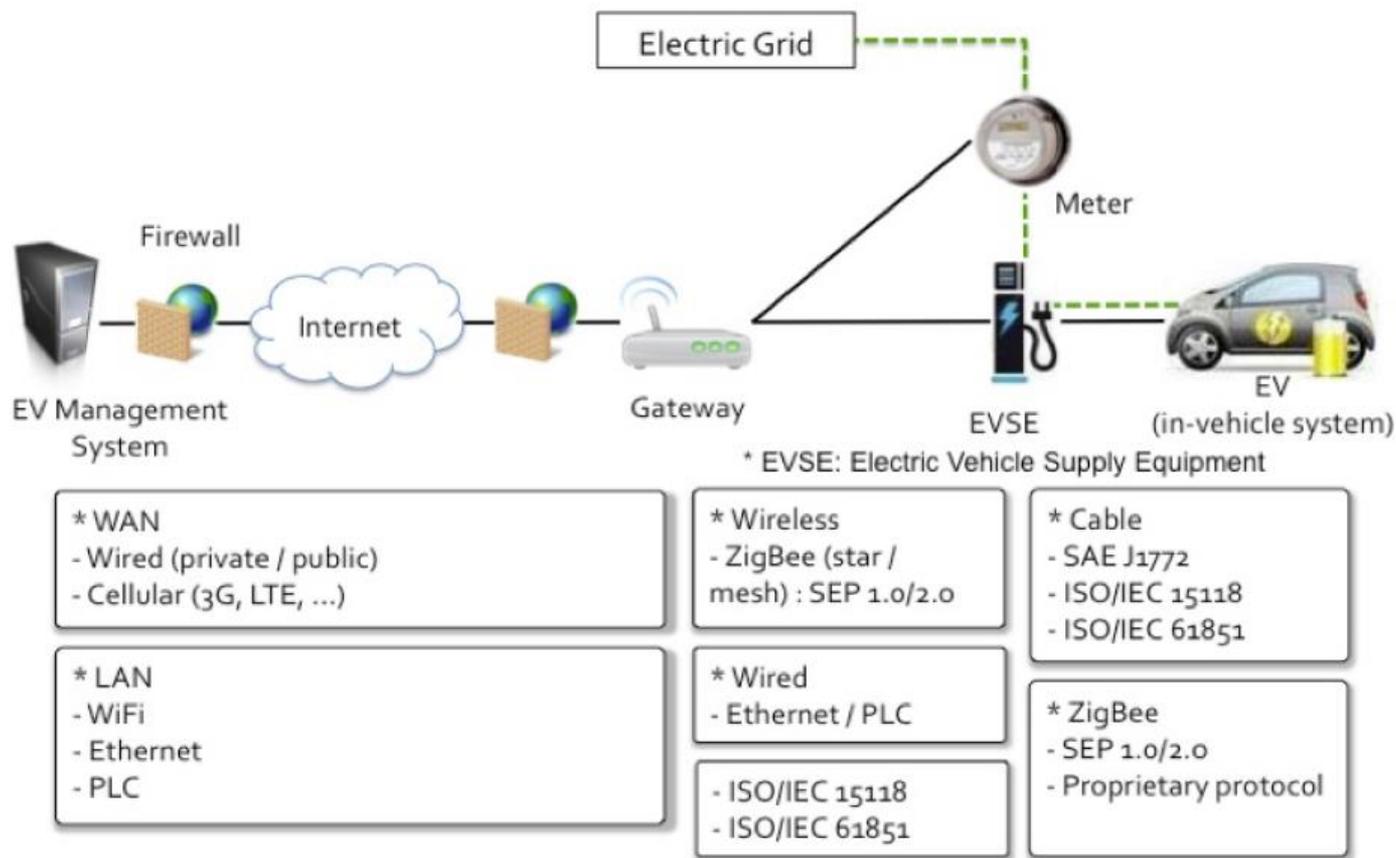


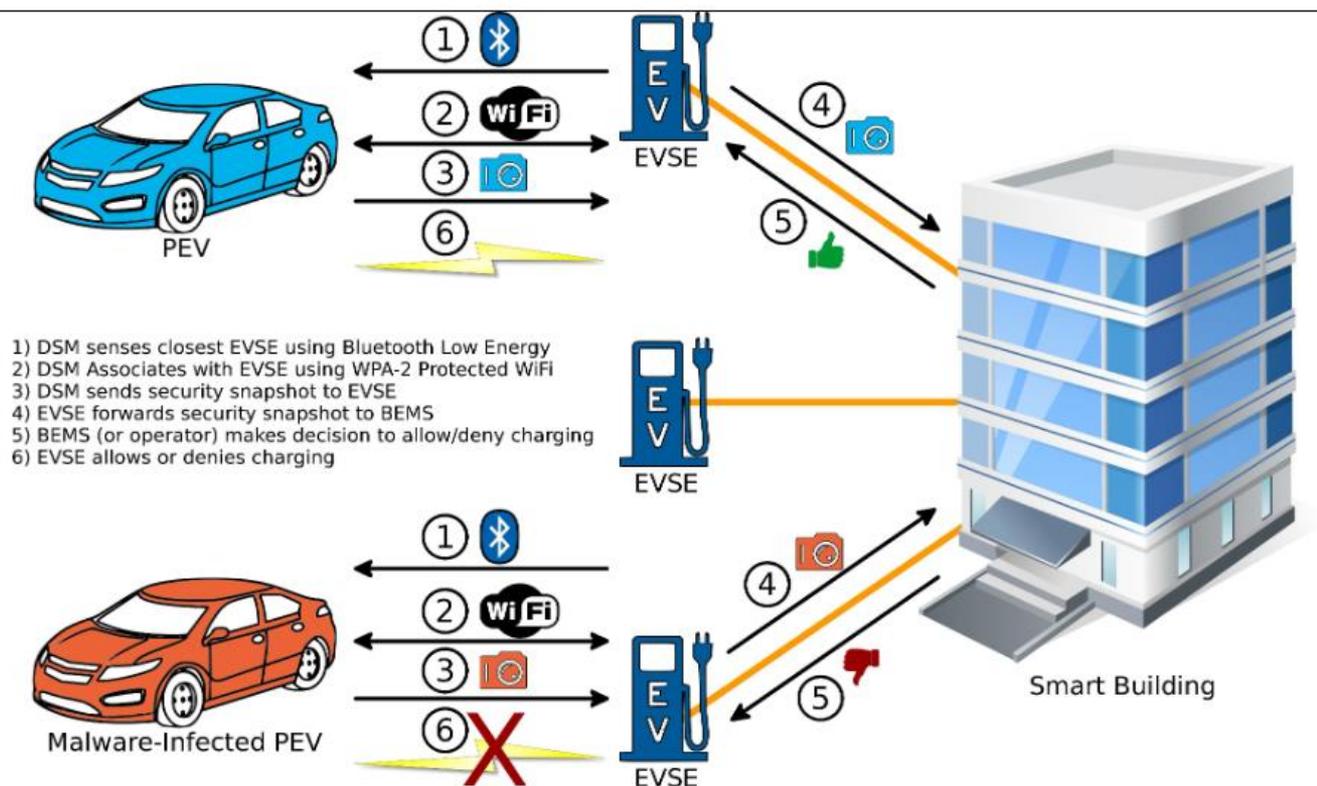
Figure 3.5a: Common ET Architecture



<http://smartgrid.epri.com/doc/NESCORGuidetoPenetrationTestingforElectricUtilities-v3-Final.pdf>

# Resource: EVSE Diagnostic Security Module

- Idaho National Lab, U.S. DOE Grid Modernization Lab Call
- CEC is Technical Advisor



- 1) DSM senses closest EVSE using Bluetooth Low Energy
- 2) DSM Associates with EVSE using WPA-2 Protected WiFi
- 3) DSM sends security snapshot to EVSE
- 4) EVSE forwards security snapshot to BEMS
- 5) BEMS (or operator) makes decision to allow/deny charging
- 6) EVSE allows or denies charging

[http://www.2017energyexchange.com/wp-content/uploads/T7S6\\_Rohde.pdf](http://www.2017energyexchange.com/wp-content/uploads/T7S6_Rohde.pdf)  
[https://energy.gov/sites/prod/files/2016/06/f32/vs184\\_rohde\\_2016\\_p\\_web.pdf](https://energy.gov/sites/prod/files/2016/06/f32/vs184_rohde_2016_p_web.pdf)



# Resources: CES-21 Cybersecurity Project

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- Lawrence Livermore National Lab pursuant to D.14-03-029
- CPUC oversees project
- Objective: conduct research toward next generation cybersecurity techniques including Machine-to-Machine Automated Threat Response to protect grid stability, reliability, safety
  - Modeling & Simulation Platform
  - Physical Test Bed
  - Automated Response Research Package



[http://www.2017energyexchange.com/wp-content/uploads/T7S6\\_Rohde.pdf](http://www.2017energyexchange.com/wp-content/uploads/T7S6_Rohde.pdf)  
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# Addressing our questions

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- Better understand utility, EVSP, and OEM security requirements
- Independent expert assessing needs
  - Prior to and during deployment
- Workshops during 2018 VGI Roadmap Update
  - Presentations from National Laboratories





# Questions & Comments

<http://www.energy.ca.gov/transportation/>

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# Post-Working Group VGI Policy Issues

- What do stakeholders think are the highest priority pilots to better understand the value of VGI?
  - Technology demonstrations
  - Deployment pilots to understand economics & scalability
- To assess the value of use cases, what additional data or analysis do we need?
  - Will any ongoing pilots provide this info?
- How do we ensure ratepayer benefits from VGI deployment?
- How should we ensure the driver experience encourages EV adoption?